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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

MAR 1932



BRANCH OF RESEARCH

March, 1932.

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APPALACHIAN FOREST EXPERIMENT STATION

General

A conference of District Inspectors under the Clarke-McNary law was held at Asheville March 21-31. Members of the Appalachian Station staff attended one day's session devoted to fire research. The program included a visit to the Bent Creek experimental forest, where the Station's work on fire damage and cutting methods was discussed. A number of the men also visited the Biltmore Estate plantations.

The Station was glad to welcome Mr. L. T. Pierce, of the U. S. Weather Bureau, who arrived in Asheville early in the month to begin investigations leading to a fire weather forecast service for the region.

Craighead and St. George of the Bureau of Entomology spent March 4 and 5 at Bent Creek observing the effects of various treatments on the control of *Dendroctonus*. They also noticed that beetles have been active throughout the winter, which has been unusually mild. The beetles have been found in all stages of development. Several new attacks have been noticed on the forest in the last few months.

Between the first of October and the first of March the weekly minimum temperatures averaged about 23° F. at Bent Creek, with an absolute minimum of 12° F. During the week of March 7 to 14, however, the temperature fell to 8° F., the low for the winter. This is near the critical temperature for the beetles and it may have killed many of the broods which were active earlier.

Management

Cutting on a unit of 18 acres on the Bent Creek forest was about half completed by the end of March. The stand is a mixture of dominant shortleaf and pitch pine with large, spreading and often defective white, scarlet, and black oaks. It is to be converted to a pine overstory for the production of sawlogs, with hardwood coppice for fuelwood. The pines, with the exception of a few defective or crowded trees, and some of the best hardwoods are being reserved. The stand above two inches d.b.h. is being cut for cordwood. A 50 per cent cruise of the unit gave the following figures:

	<u>Original Stand</u>	<u>Stand to be left</u>
No. trees per acre, all species	703	47
" " " " " pine	29	21
Total vol. i.b. per acre - all species..	1,831 cu.ft.	663 cu. ft.
Total vol. i.b. per acre - pine	518 " "	462 " "
Per cent by volume of pine	28 per cent	70 per cent.

Sixty-four per cent by volume of the original stand is to be cut.

(Over)

On two half-acre sample plots, height measurements and age counts of all felled trees were made. A record was kept of the trees going into each pile of cordwood on the plots, so that the converting factor can be determined.

Eighty-two cords have been cut at an average cost for cutting and piling of \$1.90 per cord, with a crew of three to five men at \$2.00 per day, and a foreman at \$2.50 per day..

Forest influences

Hursh made a preliminary survey of plots for studying the effect of forest litter and different humus types on the regulation of rapid run-off during periods of excessive precipitation. It is planned to use small units, in most instances plots 1/2 chain square. A number of such plots will be installed during the next few months on burned and unburned areas, on raked areas, and on partially stocked and open old fields.

Biology (Biological Survey)

The 2 quarter-acre plots on the cut-over area at Rocky Knob were intensively trapped by Burleigh for ten days. The plot on the unburned area had been trapped for rodents in December. During this second trapping period 12 mice were caught, showing that it apparently is not long before any area cleared of rodents will be repopulated again. On the burned plot 16 mice were caught, not only indicating an abnormally large rodent population due to continuous breeding throughout the winter, but illustrating the slight effect a fire has on reducing rodents in the woods.

Rodents were trapped on Bent Creek to provide a comparison with the population there the past two years and to compare the number there with that of the Rocky Knob area. The rodent population on Bent Creek was found to be considerably larger this year.

Detailed observations were started on the spring migration of birds, which will be of more interest than usual this year because of the mild winter.

Fire studies

Sims' compilation of data from semi-permanent sample plots established by McCarthy showed that for several years mortality more than offset growth of trees surviving a hard fire. One plot in hardwoods, severely burned in April, 1925, showed continuous reduction in basal area of living trees for four years; in 1929 it had a total basal area only 80 per cent as great as before the fire. By 1931 growth on the surviving trees had begun to overcome losses and the basal area had increased to 82 per cent of the original. Heaviest losses occurred in the lower crown classes of desirable species, in which the basal area

in 1929 amounted to only 41 per cent of the original. During the same period, four years after the fire, the upper crown classes (dominant and co-dominant) of desirable species suffered a net loss of 10 per cent of the original basal area.

A young stand of shortleaf pine, burned over at the same time as the hardwood plot, showed a sharp decrease in basal area in the two years following the fire, dropping to 85 per cent of the original. The lower crown classes were reduced to 64 per cent of the original basal area and the upper classes to 92 per cent. During the next 4 years the losses reduced the total basal area of all classes 3 per cent more, to 82 per cent of the amount before the fire. During the 6-year period, 1925-1931, the basal area of a check plot adjacent to the burned plot increased 14 per cent.

Two other plots, burned over in a severe fire in 1923, showed continuous reduction in basal area for 8 years. All four species present on the plot - pitch, shortleaf, Virginia and table mountain pines - showed reduction in both upper and lower crown classes. The total basal area in 1931 was only 67 per cent of that at the time of the fire.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Pine Region

The 1930 remeasurement data from Mc Plot 4 on the Stanislaus furnished a very good illustration of how improper plot selection may obscure the true picture of conditions on an area. The plot was established in 1910.

The plot was originally 10 x 20 chains with the long axis running north and south. The northern part (Plot 4B), comprising 13.8 acres is on a south facing slope and supports a rather open stand of the ponderosa pine - sugar pine type. The rest of the plot was made up of creek bottom and a north facing slope. When the creek bottom is eliminated, the southern 4.6 acres (Plot 4A) supports a heavy stand of sugar pine - fir type. Up to 1925 this area had been considered as a unit.

In 1930 the area was split into two plots as outlined above, and analysis showed the following growth figures:

Plot	P e r i o d							
	1910 - 1916		1916 - 1920		1925 - 1930		All Periods	
	Cubic	Per	Cubic	Per	Cubic	Per	Cubic	Per
	feet	cent	feet	cent	feet	cent	feet	cent
Net growth per acre annually								
Plot 4A (4.6 acres)	110.2	1.98	174.2	2.82	207.1	2.66	152.8	2.73
Plot 4B (13.8 acres)	37.6	0.68	25.7	0.45	-20.7	-0.34	22.7	0.41

The annual net growth in board feet (Scribner) has been:

Plot 4A, 713 bd. ft. per acre
 Plot 4B, 111 " " " "

The differences in growth are due to the greater capacity for growth of the sugar pine - fir type on Plot 4A, and very heavy losses on Plot 4B. When the two areas are combined the good growth on Plot 4A obscured the poor growth of the other plot, giving the impression of a large area with only a fair growth rate.

Results on reproduction study plots located near Portola, on the Plumas, show that new seedlings established since logging in 1910 have only slightly more than offset losses. The percentage of ponderosa pine seedlings increased appreciably between 1911 and 1930 inclusive.

The 8 plots are located at regular intervals across a 24-acre methods-of-cutting plot, and have a total area of 0.8 acre. The area is classed as Site III. Precipitation during the 20-year period covered has been near the critical point for reproduction, averaging about 17 inches annually.

The number of seedlings per acre increased from 1354 in 1911 to 1541 in 1930, an increase of 13.8 per cent. In 1930 the seedlings which were present at establishment showed a survival of 52 per cent. Survival of seedlings established subsequently varied from less than one per cent of the 1929 seedlings to 46 per cent of the 1920 seedlings. Losses have continued to occur, even in the advance reproduction.

In marking on this area, an attempt was made to favor ponderosa pine and sugar pine by leaving many large trees for seed production. Composition of the stand up to and including trees 3.5 inches D.B.H. is shown for 1911 and 1930 in the following table:

	<u>1911</u>	<u>1930</u>
	Per cent	
Ponderosa pine	27.3	38.5
Sugar pine	3.5	1.7
Douglas fir	7.5	4.1
White fir	9.3	4.4
Incense cedar	<u>52.4</u>	<u>51.3</u>
Total -	100.0	100.0

Ponderosa pine percentage increased and incense cedar held its own, probably due largely to the greater ability of these species to resist drouth as compared to the other species. The favoring of ponderosa pine in marking, with resultant increased seed production, was likely a contributing factor to the showing of this species.

Management - Redwood

A short trip to Eureka was taken with Wieslander and Burks to help line up data on timber types and cut-over areas from the records of Del Norte and Humboldt Counties.

Most of Hallin's time was spent in working out forms for field use on the study of cut-over areas and the effectiveness of seed trees. The field form devised for the cut-over area provides for the taking of all field data - over 50 items on each milacre quadrat - in code so that they can be punched directly on the tabulating cards.

Range Research

Talbot accompanied Mr. H. R. Guilbert, of the Animal Husbandry Division of the University of California, at Davis, on a two-day trip through the foothills of the San Joaquin Valley. Renner and Hormay made part of the trip. Mr. Guilbert discussed with us the scope and general plans of our new grazing work in which the University has shown decided interest. We, in turn, benefited from observations and discussions of Mr. Guilbert's field methods.

The Animal Husbandry Division, in connection with projects on nutrition and metabolism, has devoted considerable attention to studies of mineral deficiencies in livestock feeds, including certain range forage plants. Samples of these plants, for chemical studies, are collected at intervals of about one month, throughout the growing season. A forthcoming University publication will give the rather striking seasonal variation in chemical content of several plants. This trip enabled us to get a better understanding of the grazing experiments by the workers at Davis, and also to discuss with them the possibilities of future cooperation which apparently would be welcomed by Doctor G. H. Hart and his staff.

Following an office meeting with Director Kotok and the grazing staff, Dr. Frederic E. Clements, and Mrs. Clements, of the Carnegie Institution, accompanied Talbot, and R. W. Beeson of the Regional Office, on a three-day foothill inspection trip, a part of which was made also by Hormay and by Messrs. Edwards and Robinson of the Sequoia Forest. Doctor Clements wished especially to see our temporary plots, or forage observation stations, which have been used this winter in connection with our scouting of the foothill grazing problems. He gave us helpful advice and criticism relative to the establishment of our foothill project, and to future scouting. He appeared particularly interested in the complex plant associations in certain localities, where he found conditions that he had not previously encountered.

Forestation

March has been a month of feverish activity at Devil Canyon Nursery with practically all seedbed work, half of the transplanting and most of the planting crowded into this period.

Of interest in stock distribution has been the supplying of stock to various district rangers for planting at their headquarters in pursuance of a regional plan for the improvement of ranger station grounds. Among the numerous private owners of mountain lands who have drawn heavily upon Devil Canyon for planting stock has been Governor Rolph who received an assortment of species for trial on his ranch in the Coast Range.

On March 29 Kraebel was called to Fresno to discuss the possibilities of reforestation as an aid in the general plan of water conservation. This group comprised the agricultural, industrial and water conservation committees of the Fresno County Chamber of Commerce, and were seriously considering the employment of prison labor on a program of converting the foothill brush to timber. By tracing the history of the deforested and non-restocking brushfields as a result of repeated fire and soil-depleting erosion, Kraebel indicated the limitations of artificial reforestation in the region, and by exhibiting the findings of the various erosion and succession studies of the Station demonstrated the significance of a good brush cover in the process of water conservation.

Erosion and Streamflow

Measurements of Snow

The past winter and rainy season has been colder than the average. Precipitation in California as compared with last year has varied from practically no increase in the northern part of the State to 100 per cent increase in the southern part. A colder winter than usual converted more of the precipitation into snow, so that snow has fallen at lower elevations and has accumulated to greater depths at high elevations than at any time within the past five years. Accordingly, our erosion-streamflow installations which were fitted primarily to measure rain have been covered several

times with snow, and occasionally to depths which defied accurate measurement with our equipment at hand. It has become necessary to include provision for measurements of snow in succeeding rainy seasons at all installations. Studies on the evaporation of snow and its yield of water to the soil and in streamflow must, therefore, be included in our program of studies.

Installations in Y Watershed of Devil Canyon

The Parshall flumes in Y watershed have functioned satisfactorily during the rainy season. Preparations have been made by Taylor and Nickles of the Bureau of Agricultural Engineering and Rowe and Ilch of the Station for the coming growing season to measure the effect of transpiration of vegetation upon water flow in this canyon. Evaporation, soil thermograph and hygrothermograph installations have been installed.

Lost Creek Study

Calculations and drawings of the Lost Creek reservoir profiles have been completed by Rowe. The amount of silting in Lost Creek Reservoir from the winter's precipitation and spring run-off will be checked by a resurvey of these profiles during the summer.

Triplicate Watershed Study

A geological map is being made of San Dimas Canyon by the Geological Department of Pomona College cooperatively for the Station to furnish necessary information of the geological structure of the country rock underlying the preliminary selection of the triplicate watersheds. So far, the rock has proved to be a hard gneiss. It is known that faults are common in the mountain front, but it is not yet determined how they affect the area covered by the triplicate watersheds.

Erosion Control - Roads

Early in the month Kraebel accompanied Regional Engineer Kramer on a trip of inspection and discussion of the general problem of erosion control on forest roads in southern California. In company with Forest Supervisors Mendenhall and Elliott projects were visited in the Angeles and San Bernardino Forests to observe the effects of last winter's rains. The number and extent of "slides" and gullying seen at every point were convincing evidence of the fact that something must be done to prevent this destructive process. The cost of merely removing the debris and filling wash-outs will reach record figures this year, the equivalent of which if originally expended upon slope fixation would have prevented most of the damage. But if to these "maintenance" costs are added the serious but less obvious damages resulting from the dumping of vast quantities of silt and other erosion debris into streams and reservoirs, and the impairment of such important forest values as soil and scenery, the total charge against forest roads becomes alarming.

Conferences, during this trip, with State highway engineers and others more or less directly concerned with forest road construction, showed on the part of some a willingness to consider the job of slope fixation as a legitimate item of construction and of others as a matter of maintenance. However if it be arranged administratively, it seems indisputable that no road project should be considered complete until every reasonable effort has been made to arrest the movement of soil originated by the road disturbance itself. If this obligation is accepted "in principle" then appropriate clauses for its execution should be included in road construction specifications.

Forest Products

Logging and Milling Study

The first report on the Stanislaus study, intended for publication in the western lumber trade journals, was not quite completed by the end of the month owing to several interruptions which prevented Brundage from giving more than half of his time to the preparation of the manuscript. One of these extra jobs was the review of a new economic appraisal manual just completed by Logging Engineer J. R. Berry of Region 5. This revision of appraisal procedure was made necessary by the Forester's instructions to require the utilization of only those logs which pay their way. Many of the basic data for use in the appraisal calculations were obtained from the Stanislaus study.

New calculations just finished for the study report show the difference between full utilization and economic top-log selection on the study area. A few sample figures adapted from the sugar pine tabulations will show how the margin is raised for different D.B.H. classes.

Economic Top Utilization vs. Standard Utilization

Sugar Pine -- Site 1, Stanislaus Forest

Economic top limits for log grades 1, 2 & 3 = 14"
for grade 4 = 17"

- (1) = Standard utilization, i.e., to 9 or 10" when possible
(2) = Economic utilization.

	D.B.H.				
	20"	24"	28"	40"	52"
Vol. Avg. Tree (1)	329	613	960	2643	5599
Feet Mill Tally (2)	187	500	838	2529	5543
Left in woods	142	113	122	114	56
Cost Fell & Limb (1)	\$ 1.79	\$ 1.11	\$.86	\$.64	\$.54
Per M Tally (2)	\$ 3.15	\$ 1.36	\$.99	\$.66	\$.55
Increase	\$ 1.36	\$.25	\$.13	\$.02	\$.01
Other costs except fixed acre expense (1)	\$ 23.86	\$ 21.64	\$ 20.09	\$ 17.40	\$ 16.35
Per M Tally (2)	\$ 21.88	\$ 20.51	\$ 19.56	\$ 17.16	\$ 16.27
Decrease	\$ 1.98	\$ 1.13	\$.73	\$.24	\$.08
Value per M Tally (1)	\$ 22.40	\$ 23.80	\$ 25.50	\$ 32.15	\$ 39.62
(2)	\$ 22.83	\$ 24.37	\$ 26.21	\$ 32.63	\$ 39.86
Increase	\$.43	\$.57	\$.71	\$.48	\$.24
Margin (1)	\$ -3.25	\$ 1.05	\$ 4.55	\$ 14.11	\$ 22.73
per M Tally (2)	\$ -2.20	\$ 2.50	\$ 5.86	\$ 14.81	\$ 23.04
Increase	\$ 1.05	\$ 1.45	\$ 1.31	\$.70	\$.31

These margins must not be read as net profits, of course, for fixed acre charges - spurs, camps, mainline railroad depreciation - stumpage, interest on bonded indebtedness, and a few minor items are not included in the costs. These cannot be put on a thousand foot basis without taking account of several other variables, such as acre volume cut, seasonal cut, and so on. Also, the margins do not reflect present conditions because they are based on 1928-29-30 prices.

Under the conditions of the study, economic top utilization lowered the zero margin sugar pine tree from 23" to 21.5" D.B.H.

The effect on fixed acre costs is illustrated below.

Fixed acre costs in study are \$ 84.64

If 40 M per acre is utilized, the
fixed cost on M ft. basis is 2.12

Cutting same trees, but leaving
sub-marginal top logs, thus
reducing volume per acre utilized
by about 8%, fixed acre cost spread
over 36,800 feet B.M. becomes 2.30

Increased cost per M economic utilization
over standard utilization if 8% of latter
volume is left in the woods 18

White Fir Depreciation Study

One of the purposes of the Susanville white fir depreciation study, under Mason's charge, is to trace the effect of log and tree size and characteristics on seasoning and surfacing degrade. Degrade in drying was small, amounting to only 4.5%, so that minor variations by log size are of little practical importance. On the other hand, degrade in surfacing was severe, amounting to 38.7%, so that considerable practical value would attach to any significant variations in degrade per cent for a particular type or size of log. However, no significant variation in surfacing degrade per cent for different log sizes, position in tree, or selected log defect classifications was found, except a slight tendency of smaller log sizes to show a heavier degrade than larger logs.

A significant rise in degrade per cent was noted as the width of the lumber increases, which indicates that the size and character of a log is not so important as the manner in which it is sawed, in this species. An analysis of the lumber widths coming from different log sizes shows that a heavier percentage of 12" lumber is cut from logs under 25" than from those above 25". The reason for this is that for the smaller class of logs a 12" board is about the widest width produced at the headsaw. For the larger logs boards over 12" are produced which must be ripped into 8" or 6" lumber at the edger. Thus the center of the smaller logs is cut into 12" boards and the center of the larger logs is cut into 8" lumber in the main. A study of the 8" and 12" lumber from these two size classifications of logs shows what would be expected, namely, that 12" boards from small logs degrade more than 12" from large logs; and that for 8" widths the reverse is true.

The reason for this difference is in the location of the board in the log. Fortunately, from the manner in which the boards were numbered in the sawmill it was possible to make an approximate segregation of the 12" boards cut from the center of the log and those cut from the side of the log. A comparison of the degrade per cent from these two classifications of 6/4 x 12" lumber shows a difference of 10% in degrade and 9% in losses on a 4 Common and Better basis in favor of the side-cut lumber.

CENTRAL STATES FOREST EXPERIMENT STATION

Woodland Grazing Project (M-2)

The final draft of the manuscript "Natural Regeneration of Farm-Woods following the Removal of Livestock" has been practically completed, and will be submitted to the Purdue Agricultural Experiment Station for publication in the near future. A few changes are being made to strengthen some of the conclusions. This has necessitated some further analysis of the plot data. By grouping the plot data into five-year periods, it is possible to derive certain rather definite trends which had been suspected, but for which additional data were desired.

In studying the effect of a sod cover on the number of seedlings established following the removal of livestock, it was observed that the number of trees per acre on areas without a sod cover increased rapidly for the first six or seven years, then more gradually, but continued to show an increase up to the limit of the data at eighteen years. The tendency was somewhat surprising, as it was rather expected that the number would increase steadily to a peak at about ten or twelve years, then gradually fall off as the plots approached a normal stocking. To all appearances, many of the older plots were fully stocked, but this tendency to increase indicated otherwise. The explanation was found when on further analysis the number of seedlings per acre were grouped by height classes and compared with similar reproduction in ungrazed woodlands. It immediately became obvious that while there was a large number of seedlings per acre, the relative development of these young trees was materially less than would be expected. Consequently, a much larger number of trees per acre would be required to fully stock the area. For example, in comparing reproduction on ungrazed plots which had been heavily cut over 15 to 18 years ago, with previously grazed areas from which livestock had been excluded for a similar length of time, it was found that nearly 50 per cent of the total reproduction per acre in the ungrazed woods had attained a DBH of 0.6" or more, compared with only 1.0 per cent of the trees in the previously grazed plots. Over 75 per cent of the reproduction in the ungrazed plots were in the upper two height classes (over 36 inches high) as compared with less than 40 per cent in the previously grazed plots. All of the classes below DBH show a greater percentage in the previously grazed areas. Only 4.0 per cent of the young trees on the ungrazed plots were below six inches in height as compared with over 20 per cent on the previously grazed areas.

These comparisons rather definitely indicate that a large number of seedlings per acre, even of desirable species, is not a sufficient criterion of the ability of the area to regenerate satisfactorily within a reasonable length of time. The large percentage of seedlings under six inches high on the previously grazed plots supports the belief that much of the reproduction on these areas never survives beyond the first year. On a number of the plots which have been examined a second time, it has been observed that the character of the reproduction in this class varies considerably from year to year. Apparently out of a large crop of seedlings occurring in one year, only a very small percentage may be able to

survive and an entirely new crop of seedlings, often of a different species, may be found the following season.

Annual or possibly more frequent remeasurements of a number of the permanent plots will be necessary to determine just what these annual changes are, their extent and the factors controlling them.

Black Walnut Plantation Project (Fp-1)

Analysis of plantation black walnut yield data is being continued by Kellogg in Washington. As the work progresses, the factor of original spacing in plantations appears to be important, and it has been decided to enter original spacing as a third independent variable with age and site index. Since the procedure used in the black walnut study will serve as a guide in future work undertaken by this or other stations, the methods of data analysis and computation are being given thorough attention.

The following observations are indicated from work already undertaken:

1. A strong positive relation is found to exist between clear length of stem and age, and a fair positive relation exists between clear length and site. The older the stand is, and to a less extent the better the site, the longer will be the average clear length of the trees, and the height to the live crown. A moderate negative relation appears to exist between height of crown and original spacing: wider spacings tend to produce trees with longer crowns and less clear length of bole.

2. No significant relation appears to exist between dominant height of the walnut stand and original spacing.

3. Little variation is found in percentage of survival between poor and good sites.

Considerable data other than yield were obtained in the original measurements of the walnut plantations, and the summarization of these notes is expected to throw further light on the establishment and condition of the plantations studied. Kellogg plans to remain in Washington until the walnut study is completed.

Forest Litter Project (M-1)

Dr. Auten's manuscript on the "Porosity and Water Absorption of Forest Soils" has been submitted for publication in the Journal of Agricultural Research. A short article on this same subject has been prepared for publication in the Yearbook of the Department of Agriculture.

Laboratory work has been continued on forest litter and soil samples collected during the last field season.

Locust Borer Investigation

The month of March has been spent, chiefly, in the compilation of field data, the preparation of working plans and routine administrative work. During the last week of March seed beds have been prepared by Dr. Hall and the black locust seed which was collected during the fall, have been planted. Seed from both badly infested, and immune black locust trees were planted in this experiment. The purpose of this experiment is to study the effect of the locust borer on the progeny of the two classes of trees to determine if the borer shows any preference in its attack of these individuals.

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NORTHERN ROCKY MTN. FOREST AND RANGE EXPERIMENT STATION

Silviculture

An interesting compilation of loss of trees following cutting was made from the records of the cut-over areas study. On over twenty timber sale areas in northern Idaho, the windfall loss averaged 3.8 per cent of the white pine trees of all sizes. The figures indicate that a loss from windfall of 2 to 4 per cent may be expected in the first ten years after cutting in the case of western white pine seed trees and 3 to 17 per cent in the case of associated species. Windfall loss seems to occur most heavily in the first decade following cutting and to taper off noticeably after that. As in most other forest types, catastrophic windfall may occur occasionally and remove as much as 90 per cent of the stand in isolated spots.

Loss from causes other than windfall, such as bark beetles, fungi and logging damage, is somewhat more severe. On seed tree cuttings, this loss averaged 9 per cent in white pine seed trees (14 inches d.b.h. and up) and 14 per cent of white pines of all sizes. Loss of associated species in trees 14 inches d.b.h. and up amounted to larch 6 per cent, hemlock 18 per cent, white fir 24 per cent and Douglas fir 36 per cent. No figures are available for western red cedar.

Analysis of Fire Records

Tabulations and first draft of about three fourths of the report were completed during March. Copies of most of the tabulations were sent to the Forests for their immediate study and use. One summary table, not yet distributed, appears to be one of the most sensitive criteria of protection efficiency as yet discovered. This is a modification of the Washington office rating of percentage of B and C fires controlled intra-period and extra-period. The present system considers class A fires as well as B's and C's and the percentages controlled intra-period for each year present a rather interesting study in fire organization.

In one case the sudden change in the percentage was so obvious that one immediately suspected a change in personnel on that Forest. This proved to be true, and in several other cases similar changes have left their mark on the records. Easy seasons like 1923 and 1927, and critical ones like 1926 and 1929 tend to obscure these organization effects. The biggest effect is shown for 1930 when 11 out of 13 Forests suddenly raised their percentages controlled intra-period far above their ten year averages and in some cases to new high records, in spite of the fact that 1930 was by no means an easy season permitting quick control. As will be recognized, this sudden improvement coincides with a strong drive for faster control in R-1, and with the availability of more funds.

Averages for the thirteen forests for ten years show the following past practices; intra-period meaning before ten a.m., the day following discovery, first extra-period being between ten a.m. the first day and ten a.m. the second day following discovery, while second extra-period begins at ten a.m., the second day following discovery and continues indefinitely.

<u>CONTROLLED</u>				
<u>Class of Fire</u>	<u>Intra-Period</u>	<u>First Extra</u>	<u>Second Extra</u>	<u>Any Time</u>
Percent of Total Number of Fires				
A	60	10	1	71
B	12	4	4	20
C	2	1	6	9
All	74	15	11	100

The large number of Class A fires which go into the first extra-period uncontrolled (15-1/2% of the Class A's or 11% of the total) is worth noting because every such fire is, of course, a potential B or C. It would be interesting to know how many fires that were uncontrolled, but still Class A, in the first extra-period later became big C's. Unfortunately this cannot be determined. On the other hand, with numerous fires burning and not enough men available to man them all properly, the fire that is accurately sized up, and then neglected in order to concentrate on the fastest spreaders, proves excellence of judgment if it is finally controlled at Class A size, even in the second extra-period. This raises the difficult question of whether standards should be established for the purpose of controlling all Class A fires intra-period, or whether men should be encouraged to use their judgment and delay the attack on fires they believe can be controlled as Class A, if that delay will permit a stronger attack on fires that they are afraid will become Class C.

Census

Returns from the operators in Idaho and Montana have been coming in as promptly as in past years. However, as usual, at least 20 per cent of the reports received are incomplete. Partial editing of all schedules received and correspondence to secure additional information required more than half of Whitney's time in February and March.

Including the two consignments of completed schedules received from Region 4 and returns from the canvass of north Idaho and Montana by this Station, 52 per cent of all concerns on the mailing lists for the two states have reported.

Range Studies

Temperatures of 8° to 16° below zero each morning during the second week of March, coupled with some drifted snow curtailed outside activity during the time spent by Hurtt at Miles City. One lot of cows on a so-called low plane of nutrition was still on range feed supplemented by three pounds of cotton-seed cake and was in good, vigorous condition despite very short range at the beginning of the winter period. The remaining cattle as well as the sheep were still in the feed yards.

A very worth while conference was held in Bozeman the last of March with members of the Montana Agriculture Experiment Station, Region One and the Northern Rocky Mountain Experiment Station of the Forest Service. Co-ordination of grazing investigations was discussed and plans for closer co-operation between the Forest Service and the College were laid. The necessity for united effort is especially desirable in connection with the development of a more stable land-use policy for the plains region of eastern Montana.

Logging and Milling

Compilations for the larch-Douglas fir selective logging study showing the cost and value factors of operating the different tree sizes of larch and fir are practically complete.

An interesting comparison of the utilization phase of small tie saw-milling versus milling in band mills was made during the month.

Compilation work was completed on the Anaconda Copper Mining chuting study. This study was primarily made in an effort to overcome some of the difficulties encountered in securing the cost of chuting by tree sizes. As a result of it a satisfactory system of recording data has been developed for the proposed A.C.M. stull study.

The ponderosa pine volume table being compiled from breakage in felling data was completed about the first of March. It has been edited and accepted by Girard of the Forest Survey and is now in use on that project.

<u>Lumber Prices and Movement</u>	<u>Annual</u> <u>1930</u>	<u>Annual</u> <u>1931</u>	<u>January</u> <u>1932</u>	<u>February</u> <u>1932</u>
Idaho White Pine	33.56	27.56	23.66	23.60
Western Yellow Pine	31.64	18.24	15.80	15.50
Larch-Fir	17.32	13.26	12.60	11.37
White Fir	16.34	11.00	8.45	9.58
Spruce	21.93	16.51	12.22	14.23

<u>Shipment and Cut</u>	<u>February 1931</u>	<u>February 1932</u>
Shipment	83,882,715	56,331,260
Cut	51,457,095	16,498,917

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Selective Logging in the Douglas Fir Region

Brandstrom has completed the manuscript on Part I of the selective logging report except for a number of inserts and brief revisions.

Brandstrom spent four days in the field with Logging Engineer Ericson of the Regional Office and Assistant Supervisor Brown of the Olympic Forest. The operations of the Simpson Logging Company on the national timber sales area were inspected. The company's operating plans were outlined by Mr. Drake, logging manager of the Simpson Logging Company. A program of group selection on a rather extensive sale (setting and spur selection) is to be followed by the company in connection with their donkey logging.

The possibilities of tree selection with caterpillar tractors were also looked into and an agreement was reached to undertake experimental tree selection on the next logging area where the timber has not been felled yet.

Forest Insurance

Shepard completed the causative hazard study for Grays Harbor County, the road map now having been brought up to date by the Forest Survey. Data on the marginal length of ranch property bordering on forest land were also taken from the Clatsop and Marion County type maps.

New Public Domain

Work on the new public domain project commenced March 2, and Mr. Wilson has been rapidly organizing his plans for the prosecution of this study. A working plan is partly prepared that the detailed gathering of data may start about mid-April.

Section of Forest Products

Miscellaneous - During the month Lodewick has summarized the Douglas fir and hemlock prices for 1931 from data furnished by the Davis Statistical Bureau. These have been prepared in the form desired by the Office of Forest Management as well as in the more detailed form required by the Products office. The 1930 price summary was also made in order to keep the series complete.

Logs, Lumber, and Other Timber Products. Census - Johnson spent the entire month editing schedules and securing additional information where replies were incomplete. During the month 821 third requests were sent out. To date 945 completed schedules have been sent to Washington, 637 during the month. There are remaining 696 companies from which no replies have been received.

Growing Importance of the Small Sawmill in the Douglas Fir Region - A preliminary compilation by Johnson of the small portable and semiportable sawmills, cutting not to exceed 20 M board feet per day, in 1925 and 1929 shows the same trend in small mill operations in the Douglas fir region of Oregon and Washington as in the southern pine region. In view of this, any forestry program furthering the practice of periodic selective logging should not overlook the small operator who each year is taking increasing toll of our future forest capital.

Ponderosa Pine Mill Studies - Copies of the report summarizing the Shevlin-Hixon and Mt. Emily investigations have been sent to cooperating agencies and to the Western Pine Association for review.

Breakage Losses in Felling Timber - The report on breakage losses based on the measurement of over eight million feet of felled Douglas fir timber has been completed by Rapraeger.

Mensuration

Growth of Ponderosa Pine - The detailed computations involved in the study of individual tree growth in ponderosa pine stands are now under full swing. The information to be drawn from this study consists in the relative growth rates of the seven tree classes in all diameter classes, the effective release distance, the effect of number of sides released. The application of such information is obvious, since it will allow us to make logical choice of trees in marking of stands and to determine the value of spacing the cut. In addition all the necessary information will be obtained for predicting growth from a stand table. So far it has been ascertained that trees will feel the effect of release with stumps as far out as 40 feet and more; that number of sides released is not very important so long as there is release; that release is felt more acutely the smaller the diameter class at time of cut, with the effect diminishing the larger the diameter; that in order of growth rate the classes stand as follows: Tree Class 1, Tree Class 3, Tree Class 2, Tree Class 4, and Tree Classes 5, 6 and 7 more or less together depending upon diameter and other conditions.

Silviculture

Seed Storage by Refrigeration - The second series of tests, each covering a period of 5 years, was completed with the 1931 germination tests of noble fir seed held in cold storage. The work has demonstrated that this seed can be held in cold storage for a period of 5 years without material loss of viability, while under normal air temperatures it deteriorates before the second season. In both series of tests maximum germination was obtained during the fourth year; just why this occurs was not determined, and we have been unable to find an explanation for it.

- Phenology - Phenological observations have now been made for a period of 5 years in the Douglas fir region at about 20 stations. On recommendation of the Investigative Committee, this project was expanded this year to include the pine region of Washington and Oregon. Similar work has already been done on some of the national forests east of the Cascades in observing seasonal changes of range plants.

Regional Races of Ponderosa Pine - Kolbe computed the growth and survival data for five plantations established in 1928. His tabulations show a survival of 85 per cent on both of the two remaining plantations located west of the Cascade Range, and a survival of 20, 27 and 32 per cent on the three plots east of the mountains. The average height growth during the past year for the 10 lots that are being tested amounted to .3 foot on both plots west of the Cascades and .1, .2 and .8 foot on the three east side areas. The exceptional average height growth on one of the plantations east of the Cascade Range is undoubtedly due to its being on good farm land that had been cultivated and fertilized prior to planting. Obviously the trees are too small to give much information on the growth possibilities of the various lots, but it is interesting that the stock from the Southwest has the slowest rate of growth on all areas.

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SOUTHERN FOREST EXPERIMENT STATION

Naval Stores

A thinning time study was carried on in second-growth longleaf pine stands on the Osceola National Forest and the Olustee Experimental Forest. An axe with a 2-1/2 pound head having a single, wide, thin bit and a long handle was used for the cutting. One inch trees and some of the 2 inch trees were cut with a single stroke of the axe. From 3 to 6 inches, the time increased rapidly with diameter. The trees were cut with a stump height of 2-1/2 feet and left on the ground as they fell. The times required for thinning prospective naval stores stands of different densities are:

Acre Plot	Total No. of Trees on Acre	Trees Removed	Time	
			per Man	per Acre
A	1,086	886	4 hrs., 13 min.	
B	590	390	1 hr., 25 min.	
C	631	431	1 hr., 33 min.	
D	422	222	47 min.	

Erosion

Accelerating Effect of Frost on Erosion: The remarkable accelerative influence of frost action on soil erosion was well illustrated during March at Holly Springs in northern Mississippi. Freezing temperatures were recorded several times, on one occasion as low as 16 degrees Fahr. As a

result, measurements of soil washed from several gullies and caught in settling tanks showed much greater erosion than during the period prior to frost action.

Forestation

Peat Mat used for Germination Test: Wakeley set up the main germination tests of the year, matching each standard sand flat with one arranged on a peat mat. The peat mat that was tried out for the first time last year gives promise of excellent results, especially when fresh seed are used.

Economics

1,500,000 Acres of Tax Delinquent Land in Arkansas: Of the one and one-half million acres which have reverted to the State of Arkansas for non-payment of taxes, at least one million acres are in the 18 Delta counties. This situation is largely the result of very high drainage district taxes. Practically all of the remaining one-half million acres delinquent is in the Ozark Mountain Region, where taxes are low but the soil poor. Even low taxes are burdensome in this region during the present depressed prices for farm and forest products.

Farming and Logging: Although Lee County, Alabama, and Alcorn County, Mississippi, are farming communities, in 1929 Lee County produced 35 million feet of "roofer" boards and Alcorn County with 56 little portable mills cut 9 million feet of pine lumber (principally 2 x 4 short dimension stock). On a return trip to these two counties recently, Bond found that sawmill activities had almost ceased, for the reasons that timber is getting scarce and lumber prices remain low. The big planing mill outfits which came from Georgia into Lee County, Alabama, have moved to North Carolina and Virginia to obtain a new supply of timber. Rough "roofers" at the planing mill sell for \$7 per thousand; planed and in the car they bring about \$10 f.o.b. eastern Alabama. Prices for short dimension stock in Alcorn County, Mississippi, are about the same as these figures. In 1929 and 1930 the market prices were about twice what they are now.

Forest Pathology

A shipment of 400 pounds of Asiatic chestnut seed involving 15 strains of chestnuts was taken by Siggers from New Orleans to the Louisiana State Nursery near Woodworth. This seed has been imported from Asia in connection with a project to establish in this country varieties of chestnut relatively immune to the blight. The two-year old chestnut seedlings left in the nursery from a previous planting were shipped to Leland, Mississippi, and Bay Minette, Alabama. A third lot was planted out in the State Forest in central Louisiana.

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REGION 2 - RESEARCH ACTIVITIES IN MARCH

The situation relating to the status of the Experiment Station took a sudden turn on March 4, when Senator Costigan of Colorado succeeded in having restored to the Agricultural Appropriation Bill the item for the Rocky Mountain Station, which had been eliminated from the original bill. In view of the unsettled circumstances, there has been no choice, so far as policy is concerned, but to carry on along lines which anticipate continuation of the work of the local Station.

Practically all of the office time, which amounted to 92% of the effective working time of the technical force, was devoted to the compilation of management sample plot statistics. The particular projects upon which such work was concentrated were: thinning practice in Nebraska sandhills plantations of jack and Scotch pines (Mt-106 and 500); effect of thinning in Black Forest, Colorado, ponderosa pine, - a cooperative project with the State Agricultural College, (Mt-101); thinning in immature ponderosa pine stands in the Black Hills, (Mt-101); and management of the Fremont Experimental Forest (M-1).

In connection with the Nebraska jack and Scotch pine thinning studies, Supervisor Nelson procured additional volume measurements of both felled and standing trees. These were incorporated with data on hand in order to enlarge the range of existing volume tables for these species and to make them more comprehensive and applicable. The plotted data yielded results of such a nature as to indicate the possibility of a variation in growing conditions even under the relatively uniform site conditions which are supposed to prevail in the sandhills.

On the basis of the results obtained, Roeser prepared a paper dealing with physiological considerations which affect thinning practice in the Nebraska plantations, for the annual meeting of the Southwestern Division of the A. A. A. S. which will meet in Denver during the last week of April. In this article an attempt is made to correlate the results of the study in a practical way with the primary consideration of conserving the inadequate water supply and distributing it in the most effective possible manner.

The final results for the six jack pine thinning plots show that the average annual net diameter increase, since thinning in 1920 and 1923, has been .142" for the unthinned; .173" for the lightly thinned; .214" for the moderately thinned; and .245" for the heavily thinned stand, with average densities respectively of 2098, 1480, 896, and 696 trees per acre. The rate of accretion under heavy thinning in nine years was 72% greater than that of the unthinned stand, 43% greater than that which resulted from a light thinning, and 14% in excess of that obtained where a moderately heavy thinning was practiced. The annual rate of height growth in the order of decreasing density, beginning with the unthinned plot, has been .86, 1.10, 1.16 and 1.16 feet which seems to indicate that competition does not tend to stimulate the upward extension of the stems; in fact, it shows a definite tendency to retard it. The upward trend of volume increment under heavy thinning has been quite pronounced. Original outside bark stem volumes

equivalent to from 38 to 71% of that of the unthinned stand immediately after thinning, depending upon the degree of thinning, have increased in nine years to the point where they range from 91 to 102% of the present volume of the unthinned stand. At the present rate of growth the heavily thinned stand will surpass the volume of the original stand within eleven years following cutting.

The approved data for the 1931 Black Hills thinning plots in immature ponderosa pine were essentially in agreement with those reported in October 1931, which were based on a preliminary review of the stand data. Incidentally, the thinning of these plots has been completed, although no complete report has, as yet, been submitted by Supervisor Krueger. Data were procured on fifty-two felled trees, on the basis of which volume tables were prepared.

The cubic volume of the original stand on each of the four plots varied between 1582 and 1924 cubic feet per acre. The result of treatment was to leave a stand of 1850 cubic feet on the control plot and stands of 826, 1160, and 1512 cubic feet, representing densities of 52, 68, and 79% of the original volumes, on the three thinned plots. The control plot carries 934, and the most radically thinned plot, 204 trees per acre.

Late in March, the 2-2 stock in the ponderosa pine source of seed study representing the progeny of individual parent trees and including both natural and artificially fertilized off-spring of the local (Fremont) mistle-toe resistant strain, was dug up in the Monument Nursery and heeled in. Coincidentally, suitable plantation areas, in which the various categories of stock are to be planted, were scouted and selected. It is hoped that the planting work may be started early in April, but unless immediate and heavy spring moisture is obtained, this work will be considerably delayed. The winter precipitation deficiency since October 1 at Fremont is approximately 32%.

Supervisor Pearce in Lander, Wyoming, continued with his assignment of revising the individual Forest reports in the Engelmann spruce type strip-survey growth study. It is expected that this work will occupy his attention to the beginning of the field season. In order to get the reports in shape so that the task of summarizing and coordinating the data on a Regional basis may be undertaken next fall, Junior Forester Burton was detailed to assist Supervisor Pearce during the month of April.

REPORT OF THE FOREST TAXATION INQUIRY

The final edition of Progress Report No. 16, "Digest of Forest Tax Laws in the United States in Effect January 1, 1932," was completed and sent to Washington for duplication. The mimeographed stencils were being checked at the end of March.

The efforts of the staff have been largely confined to composing the comprehensive report and to studying and testing plans for taxing forest lands. Frequent staff conferences have been held for the discussion of these plans.

Mr. Marsh visited the Inquiry during the last week of February and participated in some of the conferences on forest tax plans.

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